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Machairodont Cats from the Early Pleistocene Broadwater and Lisco Local Faunas

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Frontispiece.—View (1939) of a portion of the main Broadwater fossil quarry (University of Nebraska State Museum Collecting Locality Mo-5) located on the Dan J. Boman ranch, 5½ miles East and ¾ mile North of Broadwater, Morrill County, Nebraska. The quarry was excavated from 1936 to 1942, including two winters, and as many as 38 men worked at one time at this site. It represents the most extensive single quarry excavation in the State of Nebraska. Additional test excavations also were made in 1965 and 1967. The holotype of *Ischyrosmilus crusafonti*, new species, was found in this quarry. The U.N.S.M. Coll. Loc. Mo-6 is located approximately ¼ mile East of the Coll. Loc. Mo-5.

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ABSTRACT

Machairodont Cats from the Early Pleistocene Broadwater and Lisco Local Faunas

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A new species of *Ischyrosmilus (I. crusafonti)* is reported from the Early Pleistocene Broadwater Local Fauna of Morrill County, Nebraska. *Ischyrosmilus* sp. is reported from the Early Pleistocene Lisco Local Fauna. *Megantereon* is reported from the Broadwater Local Fauna and this is the first record of the genus from North America.

CONTRIBUTION OF the Department of Geology, College of Arts and Sciences, and the Division of Vertebrate Paleontology of the Museum.

Schultz[1] Martin[2]

The Machairodont Cats from the Early Pleistocene Broadwater and Lisco Local Faunas.[3]

INTRODUCTION

The Early Pleistocene Broadwater Formation from western Nebraska near Broadwater and Lisco in Morrill and Garden counties has yielded felid remains which should aid in a better understanding of machairodont cats.

The genus *Smilodon* has been reported from the Early Pleistocene deposits of Nebraska by Barbour and Schultz (1939, p. 20), Schultz and Stout (1941, p. 23, Table 3; 1948, p. 563, Table 2), and Schultz (1950, p. 68, Fig. 15) but these identifications were based on incomplete specimens, including the premaxilla with canines present (U.N.S.M. 1105), obtained from deposits of the Lisco Member of the Broadwater Formation. McGrew (1944, p. 55) lists *Smilodon* sp. from the Early Pleistocene, Sand Draw Local Fauna. This record was based on a femur, F. M. (Field Museum of Natural History) No. P26164, lacking the distal end, but the present writers have not seen the specimen. However, McGrew's description, "The femur from Sand Draw differs from that of *Smilodon californicus* in having a straighter, longer, and more slender shaft and in having a deeper notch between the great trochanter and head," would seem to fit *Ischyrosmilus* better than *Smilodon.* It is now evident that *Smilodon* remains have not been recovered thus far from the Early Pleistocene deposits of Nebraska, and the saber-toothed felid examples from these sediments should be referred to the two genera *Ischyrosmilus* and *Megantereon.*

Ischyrosmilus crusafonti,[4] new species

Holotype.—Partial mandible with I_1–/C, P_3 (alv.)–M_1, U.N.S.M.[5] 25493 (Fig. 1, B).

Referred Specimen from Type Locality.—Partial left C/, U.N.S.M. 25503 (Fig. 1, C).

Type Locality.—U.N.S.M. Coll. Loc. Mo–5

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[4] Named in honor of Professor Miguel Crusafont Pairo, in recognition of his important work on European fossil felids, and for his scholarly work in connection with the Instituto Provincial de Paleontologia de Sabadell in northeastern Spain.

[5] Abbreviations used in description: alv., alveolus or alveoli; br., broken; rt., root or roots; U.N.S.M., University of Nebraska State Museum; K.U.M.V.P., University of Kansas Museum of Natural History; U.C.M.P., University of California Museum of Paleontology; U.S.N.M., U.S. National Museum; W.T., West Texas State College, Panhandle Plains Historical Museum.

(NE.¼, Sec. 20, T. 19N., R.47W.) on the Dan Boman ranch, 5¼ mi. E. and ¾ mi. N. of Broadwater, Morrill County, Nebraska. A skeleton of *Stegomastodon* (mounted in the U.N.S.M. for exhibit) was found at Coll. Loc. Mo–5. The holotypes of *Procastoroides sweeti* Barbour and Schultz and *Satherium priscinaria middleswarti* Barbour and Schultz are from U.N.S.M. Coll. Loc. Mo–6, which is of the same geologic age and located only ¼ mi. E. of Coll. Loc. Mo–5 (Barbour and Schultz, 1937). (See Frontispiece.)

Stratigraphic Occurrence.—Early Pleistocene, Lisco Member, Broadwater Formation.

Diagnosis.—Smallest known species of genus; P_3 single rooted, but proportionally large.

Discussion.—The mandible (U.N.S.M. 25493) is considerably smaller and more lightly built than the holotype (ramus) of *Ischyrosmilus ischyrus* Merriam, but it resembles the latter in most other respects. The dependent flange of *I. crusafonti* is developed to about the same degree as in *I. ischyrus,* and there are two large mental foramina along the posterior-ventral border of the flange and under P_3. These foramina are also similarly situated in the other species of the genus. The margin of the flange underneath the canine is vertical and the anterior portion of the ramus makes a flat rectangular surface. The ramus is proportionally shallower below the P_3 than it is in *I. ischyrus.* The incisors of *I. crusafonti* are caniniform, each consisting of a single cusp which is recurved posteriorly. The incisors and the canine are serrated as in *Machairodus caticopus* Cope (Burt, 1931, Pl. 45). The I_1 is small and compressed while I_2 and I_3 become progressively larger. The canine is relatively large for a machairodont cat. The P_3 was single rooted as shown by the alveolus. The P_3 appears to have been proportionally larger than that in *I. ischyrus.* The P_4 of *I. crusafonti* is slightly recurved posteriorly and has two roots. It consists of a paraconid, a larger protoconid, and a metaconid about equal in size to the paraconid. An accessory cusp (talonid) also may have been present posterior to the metaconid, but the tooth is too worn to be certain of this. The M_1 also is worn but shows a bladelike paraconid and protoconid with a deep carnassial notch between them.

The partial left C/ is coarsely serrated and, although the distal one-third is missing, the canine appears to have been a relatively short, broad tooth.

Ischyrosmilus sp.

Material.—Premaxilla with I^1 (alv.)–C/, U.N.S.M. 1105 (Fig. 1, A).

Locality.—U.N.S.M. Coll. Loc. Gd–12, near center of E. ½, SE. ¼, Sec. 13, T. 18N., R. 46W. 3 mi. E., 2 mi. N. of Lisco, Garden County, Nebraska. This is the type locality of *Gigantocamelus fricki* Barbour and Schultz.

Stratigraphic Occurrence.—Early Pleistocene, Lisco Member, Broadwater Formation.

Discussion.—This felid was larger than *Ischyrosmilus crusafonti* from the Broadwater Local Fauna, and is near the size of *I. johnstoni* Mawby. The canines are proportionally shorter than in Smilodon although they are almost as broad. They are also more coarsely serrated. The incisors are arranged in a broad curve anterior to the canines, and are large and widely spaced. They show distinct wear facets in the regions where they interlocked with the lower incisors, as in Smilodon. The premaxilla is very heavy and massive.

Megantereon hesperus (Gazin)

Referred Specimen.—Partial mandible with I_2–I_3 alv., /C (br.), P_3–P_4 alv., M_1 U.N.S.M. 25494 (Fig. 2).

Locality.—U.N.S.M. Coll. Loc. Mo–5 (same locality as holotype of *Ischyrosmilus crusafonti),* Morrill County, Nebraska.

Stratigraphic Occurrence.—Early Pleistocene, Lisco Member, Broadwater Formation.

Discussion.—The holotype of *Megantereon hesperus* (Gazin) from the Early Pleistocene Hagerman Local Fauna of Idaho is a fragment of the posterior part of the ramus with M_1. The Nebraska mandible is more complete and demonstrates a pronounced dependent flange. There is a large mental foramen underneath the anterior margin of the alveolus for P_3, and a shallow but distinct groove slightly ventral to the midline of the lingual side of the ramus. The masseteric fossa extends forward to under the anterior root of M_1 as it does in the holotype of

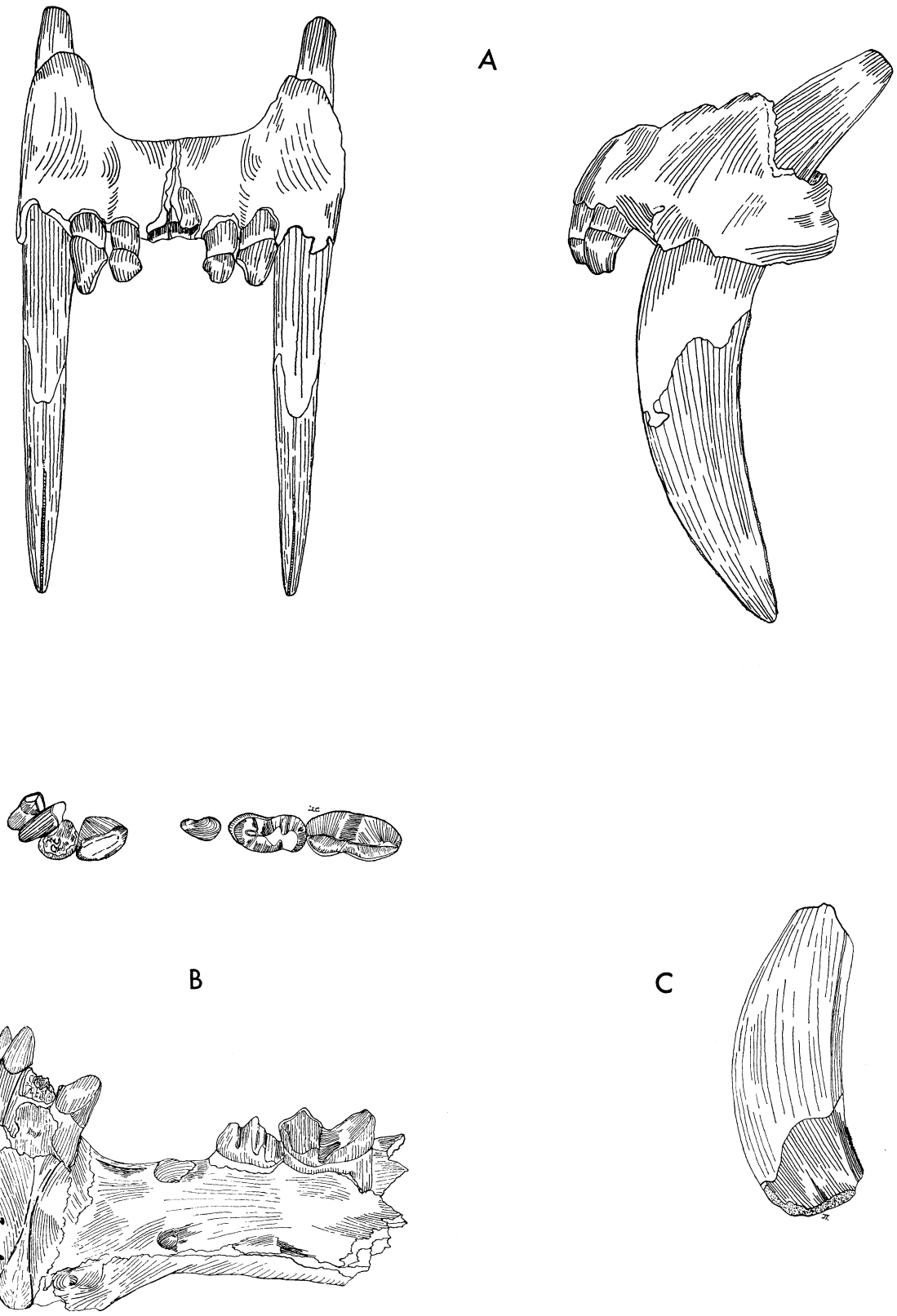

Fig. 1—A, U.N.S.M. 1105, *Ischyrosmilus* sp, premaxilla anterior and lateral views. B, U.N.S.M. 25493, holotype, *I. crusafonti* new species, left ramus, occlusial and lateral views. C, U.N.S.M. 25503, referred specimen, left upper canine. All X 3/5.

M. hesperus (Gazin). The mandible when viewed from the anterior end forms a broad rectangle with the flanges extending about 9 mm. below the ventral border of the symphysis on either side. There are several large foramina on both sides of the symphysis. The incisors are reduced and crowded. The left ramus shows alveolae for two small compressed incisors with I_1 missing. The right ramus is probably partially pathologic and shows only the alveolus for I_3. The lower canine is proportionally large. P_3 was double rooted as was P_4. Gazin (1933, p. 254) reported the following concerning the description of the holotype of *M. hesperus:* "The carnassial is relatively slender with the greatest transverse width well forward across the paraconid portion. The shearing blades . . . form a sharp angle when viewed from the side. Viewed from above the cutting edges form an angle which appears to be more acute than in *Machairodus catocopis* . . . also less obtuse than in either *Smilodon gracilis* or *Smilodon californicus*." The Nebraska specimen agrees in all important respects.

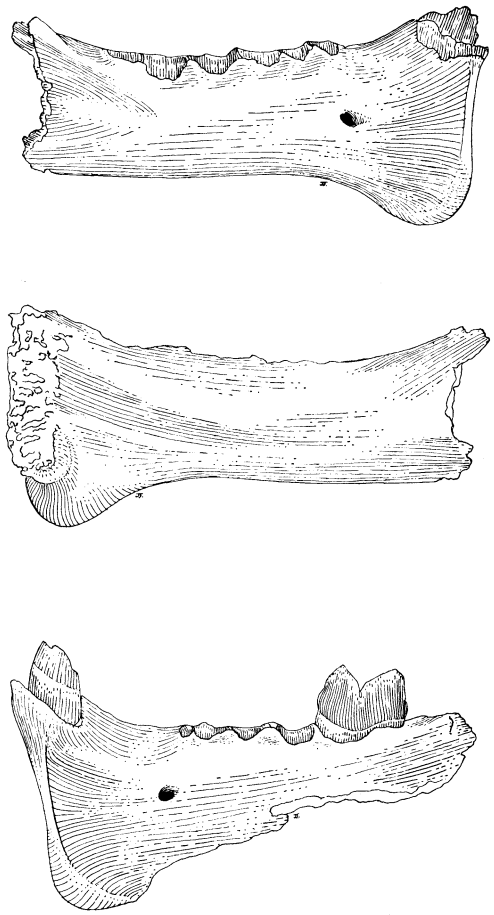

Fig. 2—*Meganteron hesperus* (Gazin), referred, U.N.S.M. 25495, partial mandible (left ramus, lateral and lingual views; right ramus, lateral view), from the Lisco Member of the Broadwater Formation, Morrill County, Nebraska. X 3/5.

TABLE 1

Ischyrosmilus MERRIAM

COMPARATIVE MEASUREMENTS OF MANDIBULAR RAMI

	Ischyrosmilus crusafonti U.N.S.M 25493 Holotype	*I. ischyrus* U.C.M.P. 8140 Holotype	*I. johnstoni*[1] W.T. 1239 Holotype	*I. idahoensis* U.C.M.P. 22343 Holotype
Depth of flange	(53.6)[2]	59.	—	—
Depth of ramus anterior to P_4	32.3	39.5	43.2	48.
Length of diastema	26.9	33.	40.	46.
Length P_3–M_1	(59.5)	(62.4)	69.8	(73.2)
Length P_4–M_1	43.8	(49.8)	48.9	58.5
Lower Canine anteroposterior	13.7	15.	—	18.
Lower Canine transverse	10.	12.5	—	13.5
P_3 anteroposterior	(10.)	7.5	13.0	(10.5)
P_3 transverse	(6.)	6.5	8.0	(6.)
P_4 anteroposterior	18.7	20.5	22.0	(24.)
P_4 transverse	9.6	12.5	10.3	(10.5)
M_1 anteroposterior	25.8	29.	28.5	(33.)
M_1 transverse	12.5	16.5	13.0	(13.)

[1] From Mawby, 1965, Table 1.

[2] ( ) = Approximate or measurement of alveolus.

TABLE 2
Megantereon hesperus (GAZIN)
COMPARATIVE MEASUREMENTS OF MANDIBULAR RAMI

	U.N.S.M 2549 Referred	U.S.N.M. 12614 Holotype
Depth of flange	(44.)	—
Depth of ramus posterior to M_1	27.7	24.
Length of diastema	22.5	—
Length P_3–M_1	(49.)	—
Length P_4–M_1	(37.8)	—
Lower Canine anteroposterior	11.6	—
Lower Canine transverse	8.2	—
P_3 anteroposterior	10.2	—
P_3 transverse	(5.8)	—
P_4 anteroposterior	(18.2)	—
P_4 transverse	(7.2)	—
M_1 anteroposterior	19.7	19.8
M_1 transverse	9.3	8.5

SUMMARY AND CONCLUSIONS

It seems likely that *Ischyrosmilus* is descended from *Machairodus (Heterofelis)* of the Pliocene of North America. The writers are aware of no valid records of *Machairodus* from the Early Pleistocene (Blancan) of North America. *"Machairodus" hesperus* Gazin is considered to be a species of *Megantereon* in this paper. The left P_4 (K.U.M.V.P. 3917) from the Rexroad Local Fauna assigned to *Machairodus* sp. by Hibbard (1937, p. 243, Pl. 2, Fig. 13) also appears to belong to the genus *Megantereon.* The anteroposterior diameter for the latter tooth is 18.5 mm. and this compares closely with the alveolar measurement of 18.2 mm. for the P_4 (U.N.S.M. 25494) of *M. hesperus.* The Kansas specimen (K.U.M.V.P. 3917) is also very similar to the P_4 of *Megantereon megantereon* illustrated by Viret (1954, Pl. 13, Fig. 3).

Mawby (1965, p. 584) compared *Ischyrosmilus* with *Homotherium crenatidens* Fabrini from the Early Pleistocene (Villafranchian) of Europe and suggests that they might be congeneric. This is possible since the skulls of the two forms are quite similar. However, in *H. crenatidens* the dependent flange is not so well developed on the ramus and its anterior border is inclined rather than being vertical as in *Ischyrosmilus.* Considering the differences in the anterior portion of the mandible, it would appear that the two forms developed independently from a common generic stock *(?Machairodus).* In this case the genus *Ischyrosmilus* Merriam should be retained, and probably also *Dinobastis* Cope. *Ischyrosmilus crusafonti,* new species, is the fourth species of the genus to be recognized. All of these species are Blancan in age, and until some idea of size variation can be obtained it remains questionable if they are all valid. However, *I. crusafonti* is decidely distinct from the other three species.

The similarity between the Blancan faunas of North America and the Villafranchian faunas of Eurasia is very striking, and with further study many more forms will undoubtedly be found to occur in both faunas. This will cause some difficulty as more and more names will be found to be preoccupied by names from the other continent. For instance, *Megantereon hesperus* (Gazin) is doubtfully separate from *Megantereon megantereon* (Croizet and Jobert), although they probably should not be synonymized until better material of *M. hesperus* can be compared. *Megantereon* apparently imigrated from Eurasia to North America at the beginning of the Pleistocene. The extinction of the Barbourofelini at the end of the upper Pliocene (Kimballian) would have left open the niche for dirk-toothed felids in North America. *Megantereon* may then have given rise to *Smilodon.* The earliest known examples of *Smilodon* appear to be those from the late Yarmouthian or early Illinoian deposits in Sheridan County, Nebraska.

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REFERENCES

Barbour, Erwin H., and C. Bertrand Schultz. 1937. An Early Pleistocene fauna from Nebraska. Amer. Mus. Novitates (942): 1–10, Figs. 1–4.

————. 1939. A new giant camel. Bull. Univ. Nebraska State Mus. 2 (2): 17–27, Figs. 5–12.

Churcher, C. S. 1965. The affinities of *Dinobastes serus* Cope 1893. Abstracts 7th Congress International Assoc. Quaternary Research (1965), Boulder: 65.

Chardin, Pierre Teilhard de. 1945. Les felides de Chine. Les formes fossiles: 3–36, 20 figures *in* Chardin and P. Leroy, Publ. Inst. Geobiol. 11: 1–58, 21 figures.

Gazin, C. L. 1933. New felids from the Upper Pliocene of Idaho. Jour. Mammal., 14: 251–256, 3 figs.

Hay, O. P. 1930. Second bibliography and catalogue of the fossil vertebrata of North America. Carnegie Inst. Washington, Publ. (390), Vol. 2: i–xiv, 1–1074.

Hibbard, Claude W. 1937. An upper Pliocene fauna from Meade County, Kansas. Trans. Kansas Acad. Sci. 40: 239–263, Figs. 1–2, Pls. 1–5.

Kurten, Bjorn. 1965. The Pleistocene Felidae of Florida. Bull. Florida State Mus., Biol. Sci. 9 (6): 215–273, Figs. 1–17, 31 tables.

Matthew, W. D. 1918. Contributions to the Snake Creek fauna, with notes upon the Pleistocene of western Nebraska, American Museum expedition of 1916. Bull. Amer. Mus. Nat. Hist. 38 (7): 183–229, Figs. 1–20, Pls. 4–10.

Mawby, John E. 1965. Machairodonts from the Late Cenozoic of the Panhandle of Texas. Jour. Mammal. 46 (4): 573–587, Figs. 1-5.

McGrew, Paul O. 1944. An Early Pleistocene (Blancan) fauna from Nebraska. Field Mus. Nat. Hist. Geol. Ser. 9 (2), Publ. 546: 33–66, Figs. 14–22.

Meade, Grayson E. 1961. The saber-toothed cat, *Dinobastis serus.* Bull. Texas Mem. Mus. (2): 23–60.

Merriam, John C. 1905. A new sabre-tooth from California. Univ. California Publ. Bull. Dept. Geol. Sci. 4 (9): 171–175, Fig. 1.

————. 1918. New mammalia from the Idaho Formation. *Ibid.,* 10 (26): 523–530, Figs. 1–5.

————. 1919. Tertiary mammalian faunas of the Mohave Desert. *Ibid.,* 11 (5): 437a–437e, 438–585, Figs. 1–253.

Merriam, John C., and Chester Stock. 1932. The Felidae of Rancho La Brea. Carnegie Inst. Wash. Publ. (422): 1–231, Figs. 1–152, 42 plates, 114 tables.

Schultz, C. Bertrand. 1950. Stratigraphic distribution of Pleistocene mammals in Nebraska. *In* Condra, G. E., E. C. Reed, and E. D. Gordon (Revised by G. E. Condra and E. C. Reed), Correlation of the Pleistocene deposits of Nebraska. Bull. Nebraska Geological Survey (15A): 1–73, Figs. 1–12, 2 plates.

Schultz, C. Bertrand, Marian R. Schultz, and Larry D. Martin. 1970. A new tribe of saber-toothed cats (Barbourofelini) from the Pliocene of North America. Bull. Univ. Nebraska State Mus. 9 (1): in press.

Schultz, C. Bertrand, and Thompson M. Stout. 1941. Guide for field conference on the Tertiary and Pleistocene of Nebraska. Special Publ. Univ. of Nebraska State Mus., (1): 1–55, Figs. 1–47, 2 charts. 1 map.

————. 1945. Pleistocene loess deposits of Nebraska. Amer. Jour. Sci. 243: 231–244, Figs. 1–5, Pls. 1–2.

————. 1948. Pleistocene mammals and terraces in the Great Plains. Bull. Geol. Soc. Amer. 59 (6): 553–558, Figs. 1–4, Pl. 1, 3 tables.

Stout, Thompson M. 1965. Broadwater Formation. *In* Schultz and Smith, Editors, *Guidebook for (INQUA) Field Conference D, Central Great Plains,* VIIth Congress, International Assoc. Quaternary Research, Nebraska Academy of Sciences Publ., Lincoln: 67–68, 1 fig.

Viret, M. J. 1954. Le loess a bancs durcis de Saint-Vallier (Drome) et sa faune de mammiferes Villafranchiens. Nouv. Arch. Mus. d'Hist. Nat., Lyon, 4: 1–200, 43 figs., 33 pls.

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